

WHAT IS CLAIMED IS:

1. A non-interactive development apparatus for use in a multicolor electrophotographic machine having a moving photoreceptor belt therein, the development apparatus being capable of developing a portion of a multicolor electrostatic latent image on a surface of said photoreceptor belt with toner without disturbance or contamination of previously developed portions of the electrostatic latent image, said development apparatus comprising:

a housing defining a chamber storing a supply of developer material comprised of carrier beads and toner;

a movable dielectric donor belt having a front and back surface with an electrode pattern being formed on said belt front surface, said belt being adjacent but spaced from the photoreceptor belt surface for conveying toner on said donor belt front surface to a development zone located in a space between said donor belt and photoreceptor belt surface;

means for supporting said donor belt for movement in an endless path past the development zone;

means for advancing developer material from the housing chamber, said advancing means and said donor belt cooperating with one another to deposit a substantially constant quantity of toner having a substantially constant triboelectric charge onto said donor belt front surface for transporting said toner through said development zone;

a stationary electrode positioned behind and in contact with the back surface of a span of said donor belt, said stationary electrode having a dimension and location to define said development zone; and

an AC voltage supply connected to the stationary electrode to provide an AC bias thereto, the AC voltage producing AC fringe fields at the edges of the electrode pattern on said front surface of the donor belt as said donor belt is conveyed past the stationary electrode, whereby said AC fringe fields cause detachment of the toner from the donor belt front surface and generation of a toner

cloud in the development zone that develops the electrostatic latent image on the photoreceptor belt surface.

2. The development apparatus as claimed in claim 1, wherein said means for supporting said donor belt is a pair of donor belt rollers, said donor belt rollers each having an axis parallel with each other and about which said donor belt rollers are rotated; and wherein said electrode pattern on said front surface of the donor belt is an array of equally spaced, electrically isolated, elongated electrodes that are parallel to each other and the donor belt roller axes.

3. The development apparatus as claimed in claim 2, wherein said means for advancing developer material from the housing chamber is a rotatably driven magnetic brush roll that advances a uniform layer of developer material to said donor belt; and wherein said donor belt is wider than both that magnetic brush roll and the photoreceptor belt.

4. The development apparatus as claimed in claim 3, wherein the development apparatus further comprises:

a first commutator connected to a DC voltage source, the first commutator being positioned on the outer edge of the donor belt front surface and at a location adjacent but outside of said development zone, said first commutator having a length substantially equal to the length of the stationary electrode and being aligned therewith in order to bias concurrently the elongated electrodes on the donor belt front surface that are in said development zone.

5. The development apparatus as claimed in claim 4, wherein said first commutator is also biased by an AC voltage source.

6. The development apparatus as claimed in claim 4, wherein a span of said donor belt between said pair of donor belt rollers is partially wrapped around the magnetic brush roll, so that a layer of developer material is sandwiched therebetween; and wherein the direction of rotation of the magnetic brush roll is opposite to the direction of rotation of the donor belt, thus forming an entrance nip and an exit nip for said developer material on said magnetic brush roll.

7. The developer apparatus as claimed in claim 6, wherein the developer apparatus further comprises:

a second commutator connected to a second DC voltage source being positioned on an outer edge of the donor belt front surface adjacent the magnetic brush roll and at said entrance nip, said second commutator electrically biasing a number of the donor belt electrodes at said entrance nip, in order to effect extraction of toner from the developer material on the magnetic brush roll and to load the toner onto said donor belt front surface; and

a third commutator connected to a third DC voltage source being positioned on an outer edge of the donor belt front surface adjacent the magnetic brush roll and at said exit nip, said third commutator electrically biasing a number of the donor belt electrodes, in order to effect removal of said toner from the donor belt and onto the magnetic brush roll after the toner has passed through the development zone, so that toner is continually loaded and unloaded from the donor belt front surface.

8. The development apparatus as claimed in claim 7, wherein the development apparatus further comprises:

a charge-relaxable overcoating layer on the front surface of the donor belt to dissipate any charge accumulation that would cause spurious electric fields.

9. The development apparatus as claimed in claim 8, wherein said developer material comprises a non-conductive toner and a carrier with a non-conductive coating; and wherein said charge-relaxable layer on the donor belt front surface is only between the donor belt electrodes.

10. The development apparatus as claimed in claim 8, wherein said developer material comprises a carrier that is conductive; and wherein said charge-relaxable layer on the donor belt front surface covers the donor belt electrodes as well as the spaces therebetween.

11. A non-interactive development system for a multicolor electrophotographic machine having a moving photoreceptor belt therein, the development system having a plurality of non-interactive development apparatus disposed seriatim adjacent the photoreceptor belt, one non-interactive developer apparatus being provided for each color to be used in developing a multicolor color electrostatic latent image, and each development apparatus being capable of developing a portion of the latent image on a surface of the photoreceptor surface with toner without disturbance or contamination of previously developed portions of the latent image, wherein each development apparatus of said development system comprises:

a housing defining a chamber storing a supply of developer material comprised of carrier beads and toner;

a movable dielectric donor belt having a front and back surface with an electrode pattern being formed on said belt front surface, said belt being adjacent but spaced from the photoreceptor belt surface for conveying toner on said donor belt front surface to a development zone located in a space between said donor belt and photoreceptor belt surface;

means for supporting said donor belt for movement in an endless path past the development zone;

means for advancing developer material from the housing chamber, said advancing means and said donor belt cooperating with one another to deposit a substantially constant quantity of toner having a substantially constant triboelectric charge onto said donor belt front surface for transporting said toner through said development zone;

a stationary electrode positioned behind and in contact with the back surface of a span of said donor belt, said stationary electrode having a dimension and location to define said development zone; and

an AC voltage supply connected to the stationary electrode to provide an AC bias thereto, The AC voltage producing AC fringe fields at the edges of the electrode pattern on said front surface of the donor belt as said donor belt is conveyed past the stationary electrode, whereby said AC fringe fields cause detachment of the toner from the donor belt front surface and generation of a toner cloud in the development zone that develops the electrostatic latent image on the photoreceptor belt surface.